

AbstractID: 10862 Title: Evaluation of setup accuracy of a stereotactic radiotherapy head immobilization mask using kV on-board imaging

Purpose: To evaluate setup accuracy of the BrainLAB stereotactic radiotherapy head immobilization mask using orthogonal projections from on-board imaging.

Materials and Methods: Eight patients were simulated and treated with the BrainLAB stereotactic head immobilization masks and CT-localizers for brain lesions using single and hypo-fractions. Orthogonal pairs of kV projections were acquired using Varian Trilogy's on-board imager. The kV projections were then registered with digitally-reconstructed-radiographs (DRR) obtained from treatment planning. Shifts between the kV images and reference DRR's were calculated: anterior-posterior (A-P), left-right (L-R) and superior-inferior (S-I). If the shifts were > 2 mm in any direction, the patient was reset within the immobilization mask until satisfying accuracy has been achieved.

Results: Shifts as large as 5 mm in the A-P, L-R and S-I directions between kV projections and DRR's were found. These shifts represent offsets between the treatment and simulation setup using immobilization mask. The mean offsets of 0.1 mm, 0.7 mm, and -1.6 mm represent systematic errors in the A-P, L-R and S-I directions, respectively, using the BrainLAB localizer. The mean of the radial shifts is about 1.7 mm. The standard deviations of shifts 2.2 mm, 2.0 mm, and 2.6 mm represent patient setup accuracy with the BrainLAB mask in A-P, L-R and S-I directions.

Conclusions: The BrainLAB mask provides less invasive immobilization system than the head ring. Relying on this system for patient setup might be associated with errors as large as 5 mm. Image-guidance with the kV on-board imager provides shifts that are required to setup patient prior to or during patient treatment. The patient may relax or move during treatment, and thus uncontrolled and undetected setup errors may be produced with patients that are not well immobilized. The combination of stereotactic immobilization and image guidance will achieve more controlled and accurate patient setup within 2 mm.